In the Claims

Please amend Claim 97, as indicated. A listing of the claims is provided in Appendix A, to this response.

Remarks

Status of Claims

Claims 63-66, 69-72 and 79-103 are pending in the application. Applicants note that Claim 63 is an independent claim, and Claims 64-66 and 79-88 depend on Claim 63. Claim 69 is an independent claim, and Claims 70-72 and 89-103 depend on Claim 69.

Claim 97 is currently amended. The remaining claims have previously been presented.

Claim Rejections under 35 USC § 112

Claim 97 was rejected under 35 USC § 112, 1st ¶. The Examiner finds that the recited composition of the precipitate could not be found in the instant specification.

The Examiner's attention is directed to [0018] of US 2007/0039522 A1, the published application. Claim 97 has been amended to parallel the language in paragraph [0018] of the specification. As for the basis of the composition being by weight, the Examiner's attention is directed to Claim 7 of the application as originally filed, as PCT/EP04/07940. The disclosure includes the original claims. MPEP § 608.01(l).

Claim Rejections Under 35 USC § 103

Claims 63-66 and 69-72 and 79-103 were rejected under 35 USC § 103(a) as being unpatentable over Larson '321, in view of Cody et al. '886.

The Examiner finds that Larsen teaches a method of reducing soluble chromate in cement comprising mixing the cement with iron (II) sulphate monohydrate. Larson does not teach obtaining the iron (II) sulphate monohydrate by concentrating sulfuric acid. Nevertheless, the Examiner maintains that it is Applicants' burden to demonstrate that the iron (II) sulphate monohydrate produced by concentrating an iron (II) sulphate

monohydrate-containing used sulphuric acid and separating the sulphuric acid from the obtained precipitate is materially different.

Cody et al. teach a process to obtain iron (II) sulphate heptahydrate by crystallization from sulfuric acid. The Examiner finds that it would have obvious to dry the iron (II) sulphate heptahydrate of Cody et al., to produce iron (II) sulphate monohydrate for use in chromate reduction in cement, as taught by Larsen. Further, the Examiner finds that "one of ordinary skill in the art at the time of the invention would have expected the titanium content in the iron sulfate precipitate would be within the claimed range of 5-15% by weight base of iron." (Nov. 10, 2010 Office Action, p. 4).

With regard to Claim 69, the Examiner finds that Larson teaches the use of ferrous sulfate heptahydrate (green salt) as a chromate reducing agent. Thus, it would be *prima facia* obvious to combine the ferrous sulfate monohydrate and the ferrous sulfate heptahydrate for use as a chromate reducing agent in cement.

Response Regarding Claims 63-66 and 79-88

Applicants have submitted the following expert reports, pursuant to 37 CFR § 1.132, in traverse of the pending rejection:

- Technical Report F 7067/1 IBAC (Institute of Building Materials Research Aachen) "Determination of the efficiency and resistance of ferrous sulphates as a chromate reductant" March 23, 2009 (Exhibit 3(a) English language translation / Exhibit 3(b) German language original); and
- Technical Report V 08/24 "Production of conditioned filter salts with titanium contents of 2.5-20% relating to iron for examination in cements" September 9, 2008 (Exhibit 4(a) English language translation / 4(b) German language original).

Additionally, Applicants submit herewith the following expert reports, pursuant to 37 CFR § 1.132, in traverse of the pending rejection:

- Technical Report V 10/17 "Production of Conditioned Filter Salts with Titanium Contents of 3-20% Relating to Iron for Examination in Cements" dated 26 August 2010, including Verification (Exhibit 5); and

- Technical Report F 7067/3 "Determination of the efficiency and resistance of ferrous sulfate as a chromate reducing agent – 3rd Interim Report" dated 2 March 2011, including a Verification. (Exhibit 6).

Technical Report V 10/17 – Exhibit 5

Technical Report V 10/17 is a detailed description of the preparation of various samples of iron (II) sulphate monohydrate-containing precipitate, which is produced by concentrating an iron (II) sulphate monohydrate-containing used sulphuric acid. Applicants note that term "filter salt" is used to describe the aforementioned iron (II) sulphate monohydrate-containing precipitate, consistent with the terminology used in the present application. (See US 2007/0039522 A1, ¶ [0017], [0018] and [0019]).

The Examiner's attention is directed to pg. 4 of Technical Report V 10/17, where the Ti/Fe ratio of Samples A, B, C, D, E and F are reported as 3.9%, 8.3%, 9.3%, 11.7%, 16.0% and 16.9%, respectively. Care was taken to partially neutralize the samples to a pH of approximately 4, so that the pH of the samples, regardless of Ti/Fe ratio was consistent.

Samples A-F were provided to Institute of Building Materials Research (IBAC) for evaluation as a chromate reducing agent.

Technical Report F 7067/3 – Exhibit 6

Technical Report F 7067/3 is an analysis of the chromate reducing efficacy of the filter salt Samples A-F, in cement. The content of ferrous ions in the reducing agents and the chromate content of the cement were determined, and the cement was mixed with an 8-fold stoichiometric amount of reducing agent to chromate content.

The results of the reduction in chromate content are set forth in Table 1. Applicants note that Table 1 also includes samples identified as V 10/18, A-C, which were prepared under different conditions than Samples A-F of V 10/17, and are not used herein for comparison of chromate reducing efficacy versus Ti/Fe ratio.

Graphical Presentation of the Data – Exhibit 7

The results of the chromate reducing efficacy of the claimed composition, based on the technical reports submitted to date, have been graphically presented by Applicants' European patent agents, Hoffmann-Eitle, and identified as Exhibit 7. The graph is entitled "Residual chromate as function of Ti/Fe content." The results are based on Technical Report F 7067/1 IBAC, Tables 1 and 2 (Exhibit 3a/3b, hereto) and Technical Report F 7067/3 IBAC, Table 1 (Exhibit 6, hereto). The abbreviations "TRGS" and "EN 196/1" refer to the two different test methods that were used, and the terms "8-fold stoich." and "12-fold stoich." refer to the stoichiometric ratio of ferrous ions to chromate in the cements.

It can be seen that there is a significant correlation between the claimed Ti/Fe ratio of 5 to 15% by weight and the chromate reducing efficacy of the iron (II) sulphate monohydrate-containing precipitate, which is produced by concentrating an iron (II) sulphate monohydrate-containing used sulphuric acid.

The Examiner's attention is directed to *Examination Guidelines Update: Developments in the Obviousness Inquiry After KSR v. Teleflex*, Federal Register / Vol. 75, No. 169, Sept. 1, 2010. In particular, the guidelines emphasize that unexpected advantages of the claimed invention continue to be relevant to rebut a *prima facie* case of obviousness. (See Federal Register, vol. 75, No. 169, p. 53645, col. 3; p. 53655, col. 3; and p. 53657, col. 1). See also MPEP § 2145.

Applicants' evidence should be weighed against the strength of the references cited as the grounds for rejection. In particular, Applicants submit that the Examiner's conclusion regarding Cody et al., namely that - "one of ordinary skill in the art at the time of the invention would have expected the titanium content in the iron sulfate precipitate would be within the claimed range of 5-15% by weight base of iron" – is not supported by the evidence. Cody et al. is directed to a method for preparing high purity titanium dioxide. As part of the process, iron is removed by crystallization as $FeSO_4 \cdot 7H2O$. Then, the copperas crystals are given "a light water wash to remove and recover any adhering solution." (Cody et al. '886, col. 4, lines 21). The Examiner recites the relative concentration of the compounds in the solution, that is, the filtrate after the copperas crystals have been removed.

There is simply no scientific basis for estimating the relative concentration of titanium to iron in the copperas crystals, which have been washed to remove and recover any adhering solution, based on the concentration ranges of titanium and iron in the filtrate. Thus, the Examiner's conclusion as to what the person of ordinary skill would have expected the Ti/Fe ratio to be is speculation, not evidence.

Applicants also note that the combination of Larsen and Cody et al. relied upon the Examiner to establish a *prima facie* case of obviousness is tenuous. Larsen teaches the use of "analytical grade" $FeSO_4 \cdot 7H2O$, which is dried to prepare $FeSO_4 \cdot H2O$. (Larsen, col. 9, lines 1-5; and Table 3). It is only in hindsight, based on Applicants' teaching, that the skilled person would use the iron (II) sulfate heptahydrate of Cody et al., in the drying step of Larsen et al. Further, as noted above, there is no evidence that the iron (II) sulfate heptahydrate of Cody et al. would have the claimed Ti/Fe content of 5 to 15% by weight.

Response Regarding Claims 69-72 and 89-103

Applicants have submitted the following expert reports, pursuant to 37 CFR § 1.132, in traverse of the pending rejection:

- Technical Report TB-QSA 0094/2010/F "Examination of the Effectiveness of Chromate Reducers," issued July 28, 2010 (Exhibit 1(a) English language translation / Exhibit 1(b) German language original); and
- Declaration of Dr. Gerhard Auer re: "US Application No. 10/569,333 (Exhibit 2)."

The Declaration of Dr. Auer discusses the identity and preparation of samples A-E, which were tested as chromate reducing agents in cement, as outlined in Technical Report TB-QSA 0094/2010/F (Exhibit 1). Referring to Exhibit 1, Copperas (green salt), filter salt (essentially iron (II) sulfate monohydrate obtained from the used sulfuric acid produced during titanium dioxide production), and three mixtures of Copperas and filter salt were tested. Verifications in the form of declarations for Exhibit 1 and Exhibit 2 have been submitted.

The Examiner's attention is directed to §§ 3.1 and 3.2 of Exhibit 1, reporting the reduction in chromate achieved with the various compositions. In particular, § 3.2

"Effectiveness when ground," shows the effect of compositions A-E at 0.7 kg/t/ppm and 1.3 kg/t/ppm. The mixtures of the Copperas and filter salt reduce the chromate content in cement significantly better than either the Copperas (green salt) or filter salt alone.

The Examiner has responded that Applicants have not compared a sufficient number of tests both inside and outside the range, to show the criticality of the claimed range.

Applicants note that there is no prior art reference disclosing the combination of filter salt (iron (II) sulphate monohydrate-containing precipitate, which is produced by concentrating an iron (II) sulphate monohydrate-containing used sulphuric acid) and green salt. Thus, the present situation is not one where Applicants are attempting to carve out a range of filter salt to green salt, from a range disclosed in the prior art. Rather, the Examiner is basing her rejection on the expected success of combining two chromate reducing agents. But, the expected success is an additive effect.

Applicants have demonstrated that the mixture of green salt and iron (II) sulphate monohydrate produced by concentrating an iron (II) sulphate-containing used sulphuric acid, as claimed in Claims 69-72 and 89-103, is a synergistic effect, relative either compound used alone. The synergistic effect is unexpected. The relevant case law provides that:

"The nonobviousness of a broader claimed range can be supported by evidence based on unexpected results from testing a narrower range if one of ordinary skill in the art would be able to determine a trend in the exemplified data which would allow the artisan to reasonably extend the probative value thereof. In re Kollman, 595 F.2d 48, 201 USPQ 193 (CCPA 1979)." MPEP § 716.02(d).

In the present case, Applicants have submitted evidence of trend, which a person of ordinary skill in the art can extrapolate to obtain the claimed range, for example, a ratio of filter salt to green salt in a range of 1:1 to 2:1.

Conclusion

The methods of reducing the chromate content in cement set forth in the pending claims have been demonstrated to provide unexpected and significant improvements, relative to the prior art cited by the Examiner. Applicants submit that the application is condition for allowance and respectfully request the same.

Sincerely,

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